

RESEARCH ARTICLE

Determination of Genetic Relationships of Quince Cultivars and Genotypes Collected from Different Centers of Origin and Diversity Using SSR Markers

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ABSTRACT

Torkashvand, M., Zeinolabedini, M., Abdollahi, H., Vatanpour Azghandi, A., and Ebrahimi, A. 2021. Determination of Genetic Relationships of Quince Cultivars and Genotypes Collected from Different Centers of Origin and Diversity Using SSR Markers. *Seed and Plant Journal* 37: 127-147 (in Persian).

The center of origin of quince is Talysh region in northwest of Iran and the Caucasus. There are numerous centers of diversity of this tree species in Iran, Republic of Azerbaijan, Turkey and Europe. In this study, the genetic relationships of genotypes and cultivars of quinces collected from the center of origin of this tree species in the west of Guilan in Iran and the Caucasus region were compared with the genotypes and cultivars from different centers of diversity of this species in Khorasan, Isfahan, Ardabil, Western Azarbaijan and Tehran provinces in Iran as well as genotypes from Turkey and Europe using 12 and 14 pairs of SSR markers developed from apple and pear. SSR markers were successfully transferred to the quinces and led to the distinction of Japanese and Chinese quinces from the genotypes belong to the genus *Cydonia*, and also grouped 63 quince genotypes in seven clusters. The highest allelic frequency (0.968) was observed in CH03g06 and KU10 markers. The germplasm of Europe was clustered in an independent group, while Quince C was grouped with the germplasm of northwest of Iran and the Caucasus. Analysis of genetic structure of the germplasm approved the results of cluster analysis and confirmed the previous reports in relation to two independent evolutionary pathways of the quinces from the Caucasus and northwest of Iran to Turkey and Europe, and the second pathway toward central and northeast regions of Iran. Comparison of these evolutionary relationships of the quince genotypes with the previous reports on morphological and organoleptic evaluations of fruits indicated that each group of identified germplasm has different breeding potential for being used in quince breeding programs.

Key word: Quince, microsatellite marker, *Cydonia oblonga* Mill., transferability, apple, pear.

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Received: 15 April 2021

Accepted: 11 September 2021

RESEARCH ARTICLE

**Study of Virulence Factors of Causal Agent of Wheat Leaf Rust
(*Puccinia triticina* Eriks.) in Iran during 2017-2021**

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ABSTRACT

Dadrezaei, S. T., Dehghan, M. A., Safavi, S. A., Dalvand, M., Shahbazi, K., Tabatabai, N., Nasrollahi, M., Nabati, E., Nazeri, A., Alah-Hassani, E., Mofidi, H., Ahmadpour, A., Malekpour, F., and Hassan Bayat, Z. 2021. Study of virulence factors of causal agent of wheat leaf rust (*Puccinia triticina* Eriks.) in Iran during 2017-2021. *Seed and Plant Journal* 37: 149-169 (in Persian).

Wheat leaf rust caused by *Puccinia triticina* Eriks is one of the most important wheat disease due to its wide distribution and yield loss in the world. Racial variation and emergence of new races leads to break the resistance of resistant wheat cultivars. To study these changes and to identify the virulence of *P. triticina* Eriks., a research project was carried out by planting trap nurseries in four cropping seasons (2017-2021) in Karaj, Gorgan, Gharakhil, Kalardasht, Ardebil, Moghan, Boroujerd, Ahvaz and Dezful. At flag leaf stage and when maximum disease infection on susceptible check was observed, the disease severity and infection type were scored based on the Modified Cobb's Scale and Rolfs *et al.* method, respectively. According to the results of this study, during four growing seasons in different locations, no virulence was observed on varieties with *Lr2a*, *Lr2b*, *Lr19*, *Lr34* gene(s) and the *Lr10/Lr27+/Lr31* gene combination, and these genes were identified as effective for wheat leaf rust disease in Iran. Virulence was observed on varieties carrying other resistance gene(s), at least in one test location, and indicated that the above genes were ineffective in those region. Differential lines carrying *Lr22a* and *Lr21* genes, with resistance reaction in most seasons, were effective genes, following the aforementioned genes, for resistance to wheat leaf rust in Iran, respectively.

Keywords: Wheat, wheat brown rust, seedling resistance genes, adult plant resistance genes, infection type.

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Received: 01 August 2021

Accepted: 16 September 2021

RESEARCH ARTICLE

**Morphological and Biochemical Fruit Characteristics and Their Relationship
with Organoleptic Attributes in Some Native and Introduced Pear
(*Pyrus communis* L.) Cultivars of Iran**

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ABSTRACT

Abdollahi, H., and Tahzibi Hagh, F. 2021. Morphological and biochemical fruit characteristics and their relationship with organoleptic attributes in some native and introduced pear (*Pyrus communis* L.) cultivars of Iran. **Seed and Plant Journal** 37: 171-190 (in Persian)

In the present study, seven native and five introduced pear (*Pyrus communis* L.) cultivars were evaluated for fruit morphological traits and biochemical characteristics including total soluble solids, total titratable organic acids, acidity of juice, sclereid cell density and size, ascorbic acid and organoleptic attributes. The results showed that in fruit morphological evaluations, the most important distinguishing traits were general shape and fruit size, length: diameter ratio, position of maximum diameter, fruit side profile, background color and size of lentils in ground color, size of over color area and the characteristics of fruit stalk. Also, three very similar cultivars, Coscia, Louis Bonne and Spadona, showed that these similarities has caused synonym and homonym names for them in some nurseries. However, they were distinguishable by the fruit characteristics including size, thickness and curvature of stalks. Total soluble solids contents of fruit varied from 14 to 17.4%, and the lowest was observed in Beurre Giffard cultivar and the highest in Felestini. Total titratable acid content of the fruit also varied between 3.4 mg g⁻¹ of fresh weight in cv. Dargazi, cv. Louis Bonne and cv. Spadona and 11.4 mg g⁻¹ of fresh weight in cv. Domkaj. In general, the highest overall score of fruit quality in organoleptic evaluations belonged to cv. Louis Bonne, which due to its excellent quality at the ripening time and other characteristics such as compatibility with the clonal rootstocks and fire blight tolerance has become the most popular commercial pear cultivar in Iran, in recent years.

Keywords: Pear, sclereid cluster, ascorbic acid, firmness of texture, commercial cultivar, distinct characteristics.

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Received: 05 July 2021

Accepted: 24 August 2021

RESEARCH ARTICLE

**Estimation of Heritability of Agronomic Traits of Sesame (*Sesamum indicum* L.)
under Non-Stress and Drought Stress Conditions using Diallel Analysis**

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ABSTRACT

Zabet, M., Barazandeh, F., and Samadzadeh, A. 2021. Estimation of heritability of agronomic traits of sesame (*Sesamum indicum* L.) under non-stress and drought stress conditions using diallel analysis. **Seed and Plant Journal 37:** 191-224 (in Persian).

To estimate general combining ability (GCA), specific combining ability (SCA) and genes action in sesame, a 7×7 diallel cross was conducted using randomized complete block design with three replications under non-stress and stress conditions in 2005 and 2006 in research field of faculty of agriculture of Birjand university. Analysis of variance showed significant differences between genotypes. Griffing analysis showed that significant GCA for all traits in non-stress and stress conditions. SCA was significant for all traits, except plant height, height to first capsule and number of capsule, in non-stress conditions. In stress conditions, SCA was also significant for all traits, except plant height, auxiliary branch number and number of capsule plant⁻¹. Hayman analysis of variance showed that additive genetic variance was significant for all traits in both conditions. The dominant genetic variance was significant for all traits, except plant height and height to first capsule, in non-stress conditions. It was also significant for all traits, except plant height, in stress conditions. Inheritance of yield and related traits was relatively high in both conditions. Broad sense heritability varied from 0.51 (plant height) to 0.99 (several traits), and narrow sense heritability varied from 0.27 (harvest index) to 0.99 (number of capsule) in both conditions. The highest (29.2%) and lowest (-9.47%) heterosis relative to mid-parent observed for grain yield in non-stress and harvest index in stress conditions, respectively. The estimated heterosis relative to superior parent was positive (0.03%) only for capsule length in non-stress conditions.

Keywords: Sesame, capsule no. plant⁻¹, seed yield, harvest index, general combining ability, specific combining ability, heterosis.

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Received: 29 December 2018

Accepted: 01 August 2021

RESEARCH ARTICLE

Grouping Some of Irrigated Bread Wheat (*Triticum aestivum* L.) Commercial Cultivars Based on Grain Quality Properties

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ABSTRACT

Farahani, H., Esmailzadeh Moghaddam, M., Mohammadi, A., Zaynali Nezhad, Kh., and Naghipour, F. 2021. Grouping some of irrigated bread wheat (*Triticum aestivum* L.) commercial cultivars based on grain quality properties. *Seed and Plant Journal* 37: 225-241 (in Persian).

The baking quality of bread wheat is affected by genotype, environment and the interaction of genotype by environment and varies depending on the cultivar and growing area. On the other hand, to produce various products in the baking industry with desirable quality properties different cultivars with different quality properties are needed. Therefore, grouping of Iranian bread wheat commercial cultivars is necessary. In this study, grain quality properties of 28 irrigated bread wheat commercial cultivars in Iran were evaluated. The results showed that the effect of environment and genotype within environments was significant ($P \leq 0.01$) for all evaluated quality properties. Bushehr and Khuzestan provinces had the highest protein content (12.6%), and four provinces in cold and temperate regions; Kermanshah, Zanjan, East Azerbaijan and Hamedan had the lowest protein content (11.4%). On the other hand, the lowest and highest protein content among the bread wheat cultivars was 11.4% to 12.7% for cv. Uroum and cv. Mehrgan, respectively. Correlation study showed that grain protein content had strong and significant ($P \leq 0.01$) relationship with zeleny, grain hardness, wet gluten content and water absorption. Therefore, protein content can be used for grouping of commercial bread wheat cultivars in Iran based on grain quality properties. Also results showed that Bushehr, North Khorasan and South Kerman produced the high grain quality and ranked in the first group.

Key words: Bread wheat, genotype, environment, grain protein content, wet gluten content, grain hardness.

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Received: 06 July 2021

Accepted: 16 September 2021

RESEARCH ARTICLE

Evaluation of Agronomic Traits, Yield Stability and Quality Properties of Potato Genotypes in Spring Potato Growing Regions of Iran

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ABSTRACT

Hassanpanah, D., Mousapour Gorji, A., Parvizi, K., Jalali, A. H., and Shojaei, K. 2021. Evaluation of agronomic traits, yield stability and quality properties of potato genotypes in spring potato growing regions of Iran. *Seed and Plant* 37: 243-266 (in Persian).

In this study, 33 potato genotypes including 31 advanced potato clones obtained from breeding programs with two commercial cultivars Agria (suitable for French-fries) and Caesar (suitable for fresh eating) as controls were evaluated for agronomic traits, yield stability and quality properties using randomized complete block design with three replications in 2015-2018 in five experimental fields; Karaj, Ardabil, Mashhad, Isfahan and Hamadan in Iran. Clones were propagated at Ardebil agricultural and natural resources research station in 2015 to supply required potato tubers for planting in five locations. During growth and after harvest, tuber plant⁻¹ and tuber weight plant⁻¹, plant height, main stem plant⁻¹, tuber shape, depth of the eyes, tuber skin and flesh colour, duration of growth, deformed tubers, tuber growth cracks, tuber hollow heart, inner ring rot of tuber, change of raw tuber flesh colour and tuber dry matter percentage were measured in Ardabil and Hamadan, and total and marketable tuber yield in five locations; Ardabil, Hamadan, Karaj, Mashhad and Isfahan. Combined analysis of variance showed that genotype, year, location, location × year, year × genotype, location × genotype and location × year × genotype significantly affected total and marketable tuber yield. Clones no. 1 (1675), 5 (1375), 8 (5675) and 26 (1027) had the highest tuber yield, respectively. Based on the results of GGE bi-plot model, high yielding clones; no. 1 (1675) and no. 8 (5675) had high yield stability and medium-early maturity, and clones; no. 5 (1375) and no. 26 (1027) had average yield stability and medium-late maturity. Clones no. 5 (1375), no. 8 (5675) and no. 26 (1027) had high tuber dry matter percentage, light yellow flesh and skin colour, without deformed tubers, without tuber hollow heart, without tuber growth cracks, good coverage, low change in flesh colour of raw tuber, low and shallow eye depth. Finally, clones 1675, 1375, 5675 and 1027 were selected as promising clones with high tuber yield and yield stability. In 2021, clone 1675 released as new cultivar with the name of Takta and clone 1027 released with the name of Rona, and are commercially available to potato growers in Iran.

Keywords: Potato, tuber plant⁻¹, marketable tuber yield, yield stability, promising clone.

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Received: 03 July 2021

Accepted: 11 September 2021